

CHAPTER 16

Digital Still Image Peripherals

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NOTE to REVIEWERS: This is a very early draft version, and no effort has been made to reconcile changes in cross references to other chapters in the guide. Please look for comments such as this in the draft, which encourage your feedback on specific issues.

Please submit comments using the form on <http://www.pcdesguide.org> or by sending e-mail to comments@pcdesguide.org.

IMPORTANT: The requirements defined in this guide provide guidelines for designing PC systems that will result in an optimal user experience with typical Windows-based applications running under either the Microsoft Windows98 “Millennium” or later or Windows2000 Professional or later operating systems. These design guidelines are not the basic system requirements for running any version of Windows operating systems.

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This chapter presents the PC 2001 requirements for digital still image peripherals, including but not limited to digital cameras and scanning devices such as sheet-fed, flatbed, handheld, film, and fingerprint scanners.

For an overview of the design and market issues, see “Scanner and Digital Still Image Device Issues” in [PC 2001 Design Initiatives reference TBD].

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Note to Reviewers: The still image initiative information is under consideration for the draft 0.5.

Digital Still Image Architecture

Windows Image Acquisition (WIA), a Windows Media Services technology, is both an application programming interface (API) and a device driver interface (DDI) for Windows operating systems. WIA provides a mechanism to enumerate available image acquisition devices, both local and remote.

The WIA DDI is designed to minimize the amount of code a hardware vendor must write, while maintaining the flexibility to craft individual solutions. This is accomplished by:

?? Providing a standard device services library that performs most driver operations.

?? Promoting industry device communications standards so that one WIA driver will support most WIA devices. For example, ISO 15740 from PIMA/IT10.

?? Not requiring that the device driver use the standard device services library, while allowing it to support custom interfaces, if needed. However, drivers will still need to implement the standard WIA interfaces.

WIA is implemented as a DCOM out-of-process server to ensure the robust operation of client applications. WIA has three main components:

?? The device manager enumerates imaging devices, retrieves device properties, sets up events for devices, and creates device objects.

?? The device service library implements all services that are device independent.

?? The device minidriver maps WIA properties and commands to the specific device.

The WIA architecture is built upon the foundation established by the Microsoft Still Image Architecture (STI), based on the WDM introduced in Windows 98 for imaging devices. WIA device drivers will be compliant with STI's User Mode Driver (USD) model. While the original USD purpose is to support TWAIN data sources and other APIs, WIA drivers will support the new WIA application interface.

Implementation details are provided in the Windows 2000 DDK. More information about this architecture is available at <http://www.microsoft.com/hwdev/stillimage/>.

Note to Reviewers: WIA support will be implemented in the versions of the operating systems following Windows 98 Second Edition and the original release of Windows 2000.

Digital Still Image Devices Basic Features

This section summarizes the basic PC 2001 hardware requirements for scanners and digital cameras.

[22.1] Device uses PC 2001 compatible port connection ~~with USB or IEEE 1394 connection~~

Note to Reviewers: This is proposed as a PC 2001 general requirement, and will be removed from this chapter if it is adopted generally. If it is not adopted as a general PC 2001 requirement, it will remain a requirement for still image devices.

All still image devices must use PC 2001 compatible port connections, such as SCSI, USB, or IEEE 1394 for all imaging peripherals. No proprietary solutions are available for PC 2001.

~~PC 2001 requires the use of USB for digital cameras that generate uncompressed images of more than 800K pixels. Although digital cameras maintain a serial port interface for mainstream connectivity, the low bandwidth and slow throughput provided by the serial port do not match the bandwidth requirements of megapixel cameras. This creates a less than satisfactory user experience while transferring images to the PC.~~

~~Multiple device support, adequate bandwidth, and ease of connectivity make USB and IEEE 1394 excellent conduits for both digital cameras and scanners.~~

[NEW] Digital still camera uses PC 2001 compatible port connection with USB or IEEE 1394 connection

PC 2001 must use either USB or IEEE 1394 for digital still cameras. Other port connections may be present on the device, but the port connection must be PC 2001 compatible.

~~All scanners and digital cameras must use PC 2001 compatible port connections. No proprietary solutions are acceptable for PC 2001.~~

Note to Reviewers: This specifically breaks out DSCs from scanners. Scanners can use SCSI.

[22.2]. [REDUNDANT] Icons provided for port and peripheral connectors

[22.3] Device ~~Device supports ICC color management~~supports sRGB output and has an ICC profile

Windows 98 and Windows 2000 operating systems support using color profiles that comply with the International Color Consortium (ICC) Profile Format specification. All color output from still-image devices must be defined. The device either must create sRGB output or must embed the ICC profile for the newly acquired image into the image file to identify the color-space information for that image.

For contact information on device profiles, see the references at the end of this chapter. The Integrated Color Management (ICM) APIs and functionality for Windows and Windows 2000 operating systems are described in the Microsoft Platform SDK and the Windows 2000 DDK.

Color-capable devices such as desktop monitors, printers, scanners, still-image cameras, LCDs, color plasma displays, or other flat-panel devices are required to install one or more ICC profiles for ICM. ~~Providing a monitor color calibration utility is recommended for generating, editing, and installing ICC profiles. The~~The sRGB profile will be distributed in Windows 98 and Windows 2000.

[NEW] Still image device meets Delta E tolerance requirements for color matching

For sRGB imaging with perceptual or colorimetric rendering, the following tolerances are required:

?? Mean Square Root (MSR) less than or equal to 45

?? Average Delta E less than or equal to 12

?? Numbers be must lower than "ICM OFF" condition

For non-sRGB image files (for example, G1.8, D50), the following tolerances are required:

?? MSR less than or equal to 55

?? Average Delta E less than or equal to 18

?? Numbers be must lower than "ICM OFF" condition

Note to Reviewers: This new requirement establishes a measurable baseline for testing color matching quality.

[22.4.] [REDUNDANT] IR device meets PC 2001 IR requirements

[22.5] Digital still image device with an IR interface uses Fast IR

To improve the customer experience, the use of fast transfer mechanisms is advocated for digital cameras. ~~It is required that every~~ Every digital camera with an IR interface must support Fast IR and include backward compatibility to Serial IR.

[22.6] Digital still image device with an IR interface provides a secondary PC interface

Devices with an IR interface must provide a secondary interface using a PC 2001 compatible port connection, such as USB or IEEE 1394, to ensure that the widest variety of imaging devices are available for use with PC applications. A non-megapixel IR camera that ships with an IR serial interface adapter complies with this requirement.

Note to Reviewers: The last sentence of previous paragraph will be deleted if PC 2001 final requirements do not allow only legacy interfaces (i.e., IR+serial = 2 legacy interfaces).

Although IR interfaces are increasingly available in desktop systems and especially mobile PCs, many PCs do not include an IR interface.

[22.7.] [REDUNDANT] SCSI device meets PC 2001 SCSI requirements

[22.8.] [REDUNDANT] SCSI device attaches to any PC 2001-compliant SCSI controller

[22.9] USB device meets ~~PC 2001 USB requirements~~ USB imaging device class specifications

All USB hardware must comply with the requirements defined in Chapter 8, “USB,” which includes the USB specifications for specific device types. ~~This ensures complete Plug and Play capabilities with USB hardware and meets all the core and device requirements for USB. For example, a user must be able to dynamically attach any USB peripheral to any USB connector. The operating system should automatically recognize the device, load and initialize the appropriate drivers, and then make the device available for use.~~

In addition, compliance with the related USB imaging device class specification becomes a requirement for PC 2001 within 90 days of when the revision number of that specification reaches version 1.0.

~~The USB Imaging Class Device Working Group is working on three specifications that, together, will comprise the category “USB Imaging Class,” as referred to in PC 98 System Design Guide. The first of the specifications~~

~~expected to reach revision 1.0, expected in Q3 of 1998, is the *USB Video Camera Device Definition*, which addresses digital moving images. The USB Imaging Class Device Working Group is expected to complete the *USB Video Camera Device Definition* specification that addresses video camera devices in 1999.~~

Note to Reviewers: This specification is currently at revision 0.8d and expected to reach revision 1.0, in Q3 of 1999. The V.0.9 specification is expected in June 1999. A v.0.9-compliant driver is planned for the next version of the Windows 98 operating system.

~~The other two USB Imaging Class specifications, which will be released after the *USB Video Camera Device Definition*, are the specifications that will contain requirements for still images. The first of these, which may be titled *USB Dual-Mode Video Camera and Digital Still Camera Device Definition*, will contain requirements for still images produced by dual-mode video cameras or digital still cameras. The second of these may be titled *The USB Imaging Class Device Working Group is also working on the *USB Still Image Device Definition* specification, and which* will contain requirements for still images produced by scanners. The USB digital still camera specification is based on ISO 15740, “Requirements for communication with digital photography devices” (<http://www.pima.net/it10a.htm#15740>).~~

~~Manufacturers are urged to participate in the USB Imaging Class Working Group. For information, see <http://www.usb.org>. Also, manufacturers should urge their competitors and peers to join. The more companies that participate in creating the specifications, the sooner they will be released.~~

Note to Reviewers: The USB Still Camera spec is at v.0.7 in May 1999 and is expected to be complete by Q1-2000. Changes update current spec status.

[22.10] USB device supports string descriptors

The device descriptor, as listed in Section 9.6.1 of the USB specification, must have valid iManufacturer and iProduct string descriptor indexes. All USB imaging devices must comply with requirements defined in Sections 9.4.3 and 9.6.5 of the USB specification.

The iProduct string ~~will identify~~identifies the device to the end user during initial hardware detection, creating a better end-user experience.

~~22.11. [DELETED] USB imaging device has a zero-bandwidth alternate interface~~

Note to Reviewers: Recommendations are not included in PC 2001

~~22.12. [DELETED] USB device does not saturate the USB bus~~

Note to Reviewers: Recommendations are not included in PC 2001

[22.13.] [REDUNDANT] USB device follows PC 2001 USB performance recommendations

Note to Reviewers: Redundant w/ general USB requirements

[22.14] Digital camera uses PC-compatible file system for removable storage

For devices that include removable flash memory, a file system that is PC-compatible must be provided. The Flash Translation Layer (FTL) specification is an example of such a file system.

[22.15] Digital camera stores images in ~~common file formats such as JPEG or FlashPix~~ JPEG-compressed file format

Enhancing the user experience is essential for the widespread use of digital images. Increasing satisfaction can be accomplished by standardizing on the file format used to store the image inside the camera, providing interoperability between devices and software. JPEG, TIFF, BMP, GIF, and PNG file filters are incorporated in a great number of image and productivity software, providing comprehensive imaging support so that images can be shared.

~~Reducing the time required to transmit and process images will also further the use of digital images. The FlashPix (FPX) file format provides a rich experience with digital images, offering multiple resolution levels and allowing local region edits, improving the user experience. In the future, the FPX file format is expected to be universal, especially in Internet-related imaging. A digital still camera must provide the user with the option to store images in a JPEG-compressed format.~~

[22.16.] [REDUNDANT] IEEE 1394 device meets PC 2001 requirements for IEEE 1394a

PC 2001 Design for Digital Still Image Devices

This section summarizes requirements related to the PC 2001 design initiatives described in ~~Part I~~ Part [X] of this guide.

Plug and Play for Digital Still Image Devices

The items in this section are requirements for Plug and Play capabilities. For Plug and Play requirements related to parallel ports, see Chapter 13, [“I/O Ports and Devices,”](#) or the related bus port requirements in [Part 3](#) of this guide.

[22.17] If implemented, serial device connection complies with Plug and Play External COM Device Specification v. 1.0

A PC 2001 device cannot use a serial connection as the sole connectivity option.

To improve the installation process, imaging devices with a serial port interfaceIf a serial interface is implemented in addition to other connectivity options such as USB, the device must provide full Plug and Play support for the PC connectivity using serial enumeration. Serial enumeration provides a mechanism to support automatic configuration capability for peripheral devices that connect to a PC—using Asynchronous Serial Data Interchange on standard serial ports, commonly known as COM ports.

For information, see the *Plug and Play External COM Device Specification, Version 1.0*, available at <http://www.microsoft.com/hwdev/respec/pnpspecs.htm>.

[22.18.] [REDUNDANT] Plug and Play capabilities implemented for all supported buses

[22.19.] [REDUNDANT] Each device has a Plug and Play device ID

[22.20] Daisy-chained parallel port imaging devices must be Plug and Play capable

Daisy-chained parallel port devices, such as scanners, must be Plug and Play capable as defined in Chapter 13, [“I/O Ports and Devices.”](#) The daisy-chained parallel port device must be capable of answering Plug and Play requests from the host. Because of end-of-chain issues with IEEE 1284 and IEEE 1284.3, it is also required that all pass-through devices comply with IEEE 1284.3.

[NEW] Device firmware supports ISO 15740 protocol

ISO 15740 defines a common protocol for all digital still cameras, ensuring PC connectivity using a generic driver provided with the Windows operating system. This protocol is an international standard supported by imaging industry leaders. ISO 15740 ensures interoperability of digital still cameras, including PC and peer-to-peer connectivity.

For information, see the draft for ISO 15740, “Requirements for communication with digital photography devices” at <http://www.pima.net/it10a.htm#15740>. When the standard becomes final, it will be available from ISO. See also the implementation guidelines in the Windows 2000 DDK.

Note to Reviewers: Transport implementations for future versions of Windows operating systems are under development. Microsoft is investigating providing transport drivers for USB, IR, and 1394. Vendors will be able to access their extensions to the protocol by writing a dynamic add-on component to the generic WIA driver provided in Windows.

This ensures device will work with built-in generic driver; matches USB imaging spec baseline

Digital Still Image Device Power Management

This section summarizes the specific power management requirements for scanners and digital still image devices.

[22.21] Device supports power management requirements for its bus

The device must support the power management requirements for the bus it uses, as defined in ~~Part 3~~Part [X] of this guide.

Device Drivers and Installation for Digital Still Image Devices

This section summarizes the device driver requirements for scanners and digital still image devices.

[22.22.] [REDUNDANT] Device drivers and installation meet PC 99 requirements

[22.23] Driver support is implemented under the Still Image architecture

Still image devices must provide drivers based on the ~~Still~~Windows Image Acquisition architecture (~~STI 1.0 or later~~);(WIA). The services provided by ~~STI~~WIA provide hardware abstraction, installation wizards, and event polling.

Note: The IR bus interface is exempt from this requirement.

Still image devices capable of creating video streams also must provide a WDM minidriver based on WDM Stream class support.

For information about the ~~Still Image~~WIA architecture and ~~the~~ WDM Stream Class support, see the ~~Windows 98 DDK and the~~ Windows 2000 DDK. See also the related articles on the web site at <http://www.microsoft.com/hwdev/stillvideo/>.

Note to Reviewers: Matches architecture planned for OS release in PC2001 timeframe

[22.24.] [REDUNDANT] Applications provided with the device meet Win32 specifications

[22.25] Device driver supports TWAIN 1.7 or later

For those devices that ship a TWAIN datasource, the device must support TWAIN v. 1.7 or later, ensuring it can run without a hardware-specific user interface and download *n* number of images at a single time.

~~Note: fingerprint scanners are excluded from this requirement.~~

Note to Reviewers: Fingerprint scanners don't ship with TWAIN datasources.

[22.26] Digital still image device with an IR interface uses the Windows Sockets interface

Windows 2000 does not provide support for IrComm-based devices. For imaging devices that include an IR interface, an IR driver must be provided that is based on the Windows Sockets interface. For more information, see "Wireless Component Requirements" in Chapter ~~13~~[X], "I/O Ports and Devices."

Note to Reviewers: This should be part of the IR requirements section. This will be removed in a future draft.

[22.27] Asynchronous imaging device with an IEEE 1394 interface uses SBP2Port

SBP2Port is the IEEE 1394/SPB2 protocol/transport driver in the Windows 98 and Windows 2000 operating systems. It and provides transport services for SCSI-like commands over IEEE 1394.~~It is recommended that~~ Asynchronous imaging devices must use SBP2Port to communicate over IEEE 1394 if converting the device from a SCSI or SCSI-like interface.

Implementation details are described in the Windows 2000 DDK.

Note to Reviewers: Change matches current OS driver implementation.

Checklist for Digital Still Image Peripherals

- [22.1] Device uses PC 2001 compatible port connection
- [NEW] Digital still camera uses PC 2001 compatible port connection with USB or IEEE 1394 connection
- [22.2.] [REDUNDANT] Icons provided for port and peripheral connectors
- [22.3] Device supports sRGB output and has an ICC profile
- [NEW] Still image device meets Delta E tolerance requirements for color matching
- [22.4.] [REDUNDANT] IR device meets PC 2001 IR requirements
- [22.5] Digital still image device with an IR interface uses Fast IR
- [22.6] Digital still image device with an IR interface provides a secondary PC interface
- [22.7.] [REDUNDANT] SCSI device meets PC 2001 SCSI requirements
- [22.8.] [REDUNDANT] SCSI device attaches to any PC 2001-compliant SCSI controller
- [22.9] USB device meets USB imaging device class specifications
- [22.10] USB device supports string descriptors
- [22.13.] [REDUNDANT] USB device follows PC 2001 USB performance recommendations
- [22.14] Digital camera uses PC-compatible file system for removable storage
- [22.15] Digital camera stores images in JPEG-compressed file format
- [22.16.] [REDUNDANT] IEEE 1394 device meets PC 2001 requirements for IEEE 1394a
- [22.17] If implemented, serial connection complies with Plug and Play External COM Device Specification v. 1.0
- [22.18.] [REDUNDANT] Plug and Play capabilities implemented for all supported buses
- [22.19.] [REDUNDANT] Each device has a Plug and Play device ID
- [22.20] Daisy-chained parallel port imaging devices must be Plug and Play capable
- [NEW] Device firmware supports ISO 15740 protocol
- [22.21] Device supports power management requirements for its bus
- [22.22.] [REDUNDANT] Device drivers and installation meet PC 99 requirements
- [22.23] Driver support is implemented under the Still Image architecture
- [22.24.] [REDUNDANT] Applications provided with the device meet Win32 specifications
- [22.25] Device driver supports TWAIN 1.7 or later
- [22.26] Digital still image device with an IR interface uses the Windows Sockets interface
- [22.27] Asynchronous imaging device with an IEEE 1394 interface uses SBP2Port